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Small hydropower stations in Greece: The local people's attitudes in a mountainous prefecture

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ABSTRACT

During the last years, it has become evident that operation of hydropower stations creates discussions and different views on the local communities. Especially, although the issue of operation of small hydropower (SHP) stations or plants is of considerable interest in Greece, almost no study has been conducted to investigate the current status of Greek citizens' attitudes towards utilization of the available hydropower potential through SHP. The present study, therefore, aims to examine in the prefecture of Ioannina, Greece, the local people's attitudes on operation of SHP stations in connection with the increased public interest for environmental and social dimensions of small hydropower stations, and to determine how these attitudes change with respect to various factors.

Contents

1. Introduction

Population growth combined with human effort to improve the standard of living has led to rapidly consumed enormous energy reserves for the creation of which was required to spend thousands of years. In particular fossil fuels are currently the main source of energy for both developed and developing countries, contributing thus decisively to their development, since that economic development of a country is in line with energy consumption, due to the close association between GDP and in capita energy consumption [1,2].

The energy problem along with the problem of environmental pollution has become particularly important and their resolution has become imperative globally. The interest which has been created towards reducing consumption of fossil fuels, is supported by parallel efforts to reduce pollutants emitted into the atmosphere as well as the so-called greenhouse gases, which are considered as potential climate change factors [3–5].

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In many technologically advanced countries, measures are taken for the sustainable management of energy based on the substitution of fossil fuels with renewable energy as well as energy conservation.

The renewable energy sources (RES) (wind, solar, hydro, biomass) for many countries (developed and developing) are an important source of energy with positive prospects as concerns their contribution to energy mix, contributing significantly to reducing energy dependency of mankind on finite energy sources (especially the expensive imported oil) and strengthening the security of their energy supply. Also their positive effects on emissions of CO_2 and other pollutants, the creation of new businesses and employment, rural development, namely strengthens the three pillars of sustainable development [5–7]. At the same time the implementation of RES projects (mainly wind farms) is accompanied several times by reactions of local communities, people with conflicting interests and environmental organizations [8,9].

The European Union has taken major initiatives to promote renewable energy sources. The Directive 2001/77 prioritizes the increase of RES contribution, allocates obligations under the Kyoto Protocol on member states - and sets the Community framework. The target for the 2010 electricity production from RES is around 12% of gross energy consumption and 22.1% for the consumption of electricity, and the national targets are distributed accordingly.

Member-States are asked to take measures to remove any legal-administrative obstacles to fulfill their commitments. Each country is required in drafting national reports on the evolution of the penetration of renewable energy every 2 years and the Commission shall deliver every 5 years relevant reports to the Council, which analyzes the progress, redefines goals and analyzes the perspectives and proposed measures for the future.

Today the greater part of energy produced by renewable natural resources is related to water. Hydropower is an important natural resource and the largest one used for electricity [10]. A hydrodynamic facility has continuous operation, does not emit carbon dioxide and other pollutants, and has longer life compared to plants based on coal or nuclear energy.

Hydropower is a renewable energy source since it uses the energy from the naturally replenished hydrological cycle. Currently, hydropower stands for more than 9/10 of all renewable energy generated, and constitutes one of the most viable future energy sources.

Some of the main beneficial characteristics of hydropower are the following [11]:

- It uses resources that are widely available around the world.
- It has been proven a reliable and advanced technology, with more than a century of experience.
- It has the lowest operating costs and the longest plant life, compared with other large scale technologies for power generation.
- The fuel of hydropower energy (i.e. water) is a renewable source of energy, not subjected to market fluctuations.

2. Hydropower generation in world – EU

According to available data the new hydroelectric facilities annually produce more than 10.5 GW worldwide [11]. In 2008, the global hydropower production has increased by 2.8%. The world's total technical feasible hydro potential is estimated at 14,000 TW/year, which is slightly lower than the entire planet electricity production for the year 2005 (approximately 15,000 TW). According to various estimations about 8000 TW/year is currently considered economically feasible for development. This advance is mainly due to China where the increase was 20.3% [12].

As International Energy Agency (IEA) forecasts the hydropower production in the world will increase by an average 2% per year. In developing countries is expected the largest increase of this [13,7].

The countries with the largest production of hydroelectric energy are China, Brazil, Canada and the USA. In particular the contribution of hydropower in total electricity production is very important since that in Brazil amounts to 85.56% and in Canada to 61.12% [12].

In Europe, the contribution of hydropower energy in total energy ranges from 0% to 99%. Countries that are the largest producers are Russia, Norway, Sweden and France. Specifically, Norway is the first country not only in Europe but worldwide that is fed by hydropower at 98.25%.

Most European hydropower projects are located in Western Europe and Scandinavia. The installation of new hydroelectric power stations (2210 MW) is in progress in at least 23 countries with the most important plants being in Bosnia, Bulgaria, Germany, Greece, Iceland, Ireland, Italy, Norway, Portugal, Romania, Slovenia and Ukraine with a plan to construct plants of additional 8000 MW capacity in the near future [11].

Although large-scale hydroelectric plants produce the greatest amount of hydroelectric power, there are situations which require the development of small hydropower stations (SHP). The rated power of a SHP is usually less than 10 MW, while all stations with rated power less than 1 MW are characterized as mini. For very small applications (rated power less than 50 KW) one may also use the expression "micro-hydropower station".

Taking into consideration that the most appropriate locations in Europe for the installation of large hydropower (LHS) stations have already been exploited as well as the strong opposition of local communities towards new hydropower stations claiming important environmental impacts, small hydropower stations remain an attractive opportunity for further utilization of the available hydro potential throughout Europe.

According to the report of ESHA (European Small Hydropower Association) for 2004 in the EU-15 14,000 small hydropower stations operated at an average size of 0.7 MW, in the new Member States E-10 about 2800 SHPs (0.3 MW average size) and in the candidate countries about 400 SHP stations (1.6 MW average size). It is estimated that potentially in this sector the direct employment could rise to 15,000 and indirect employment to 28,000 jobs (European Small Hydropower Association). In Norway in 2005, about 350 mini hydropower stations were operating (up to 1 MW) and about 300 small hydropower stations (1–10 MW) [14]. In Switzerland in 2008 operated more than 1000 SHP stations with an installed capacity of 760 MW and annual production of 3400 GW [15].

The vast majority of installed SHP capacity (81.5%) is concentrated in 6 Member States. These largest EU producers of electricity from SHPs in recent years are Italy, accounting for about 21% of the total SHP installed capacity, followed by France (17.5%), Spain (15.5%), Germany (14%), Austria (9.4%) and Sweden (7.7%). The largest capacities in the new Member States are in Romania (3%), Czech Republic (2.4%) and Poland (2.3%). However, this does not always correspond to a large percentage of the total energy from renewable energy sources or in total energy consumption.

In particular, France although produces a large quantity (6754 GW in 1997 and 5823 GW in 2005) holding the second and third place in Europe in 1997 and 2005, respectively, the energy produced by SHP stations is only 10.15% (10.38% in 2005) of the total energy from RES and 1.53% (1.15% in 2005) from the total energy consumed in the country.

Regarding the percentage of total energy production from RES in the first places are Belgium, Germany, Estonia, Czech Republic, Luxembourg and Poland in 1997 and Bulgaria, Estonia, Luxembourg, the Czech Republic and Poland in 2005. In these countries it

appears that SHP have a prominent position among the RES but this does not mean that renewables have a good rate on their energy balance (Belgium - 1.1% and 2.3%, Estonia - 0.1% and 1.1% Luxembourg - 2.1% and 3.2% for 1997 and 2005, respectively).

On the other hand there are countries where energy consumption from renewable energy sources is large enough (Latvia - 46.7% and 48.4%, Croatia - 38.3% and 36.3% in 1997 and 2005) and simply exceed little SHP contribution (Latvia - 0.12% and 0.89, Croatia - 0.71 and 0.62 in 1997 and 2005).

Austria, Spain, Italy and Sweden present also large percentages of energy produced by SHP of total energy consumption which are respectively 7.63%, 2.5%, 2.81%, 2.99% in 1997 and 5.46%, 1.38%, 2.21%, 2.31% in 2005. Note that the percentages of energy from SHP stations in the total energy consumption are reduced by 2005 and there is generally a negative average growth rate of energy production from SHP. Only the newly EU countries are excluded [Bulgaria (24%), Estonia (28%), Latvia (31%) and Turkey (62%)] [16]. In India, the SHP stations contributed in the total hydropower generation 6% till December 2007 [7].

The SHP have significant advantages such as instant connectivity-decoupling to network or autonomous operation, reliability, power of excellent quality without variations, the optimal behavior over time, their long life, low maintenance and operating costs, zero emissions, low environmental impact and at the same time satisfy other needs and water use (irrigation, etc.) [17,18,6,19,20,11,21]. SHP stations are also a powerful tool for local and sustainable development since that enable local businesses to participate in the installation, renovation and maintenance of the SHP, are a viable option for electrification of remote areas, due to their small size and simplicity of technology, they have a teaching function because they allow the monitoring of practical problems of energy production and stimulate development of ecotourism [22]. In conclusion, small-scale hydropower is one of the most economic, efficient and reliable energy technologies to provide electricity.

A SHP station is one of the softest environmental installations with significant environmental benefits such as the potential reduction of Greenhouse gases, the utilization of natural resources and the creation of new water biotopes. In addition to the above, one could mention also several technical, economical and social benefits.

Unfortunately, despite the latter advantages offered by SHP stations, EU national governments do not rank SHP stations' installment as a first priority issue, mainly due to the big RTD maturity, the risk analyses and their potential negative impacts on river activities such as fishing. In fact, according to experts on the environment, most efforts for more "environmental friendly" small hydropower stations should be concentrated in reducing the problems associated with the reduction of aquatic species [23].

3. The energy sector in Greece, RES and SHP stations

Greece is highly energy dependent, in particular on oil. The degree of energy dependence is important because the cost of imported energy poses serious problems, in domestic prices, employment, and causes uncertainty in the supply of energy resources in times of crisis. The energy dependence can be reduced significantly with: (a) substitution of some energy resources (mainly oil) by finding and exploiting indigenous sources of energy such as renewable energy, (b) energy conservation and (c) rational use of energy [5].

The Greek energy system in the last decade is undergoing major changes and challenges. The penetration of natural gas, the construction of trans-European networks, the promotion of renewable energy, energy savings, liberalization of the electricity and gas, security of supply, and environmental commitments of the country (fulfilling obligations arising from the Kyoto Protocol) are the new data.

According to the "White paper for energy" [24] the contribution of RES in electricity consumption in Greece should be raised to 20.1%. By 2005 this figure was 11%, of which 8.5% is the generation of electricity from large hydropower stations (LHPs) and only the 0.4% of SHP (Private 0.1% and Public Power Corporation (PPC) 0.3%) [25].

Hydropower plants cover most of the energy produced from RES in Greece. In 2006, the contribution of hydropower reached 77% of energy produced from RES [26]. Hydropower is a proven technology for electricity generation, contributing with almost 20% to the fulfillment of the planet electricity demand. Greece, and more precisely the west and the north part of the mainland possess significant hydropower potential that is up to now only partially exploited.

In Greece, up today, exist 15 large hydropower (LHP) stations of total capacity of 2950 MW and almost 50 SHP stations, with total rated power 70 MW.

The first two large hydropower stations being in operation since 1954 are of Agras and Louros. Since then, several much larger hydropower stations have been constructed, like the ones of Kremasta (440 MW), and Kastraki (320 MW) in west central Greece [11]. Four of the largest LHP stations in Greece are located in west Greece and central Macedonia, including the power stations of Kremasta (440 MW), Polifito (375 MW), Kastraki (320 MW) and Pournari-I (300 MW).

During the last years, no other new large hydro plant has started operation. The last LHP station which entered the Greek electricity generation system is the one of Platanovrisi in 1999. The hydropower station of Messochora in Thessaly – of a rated power capability of 170 MW – despite the fact that is ready for utilization, this could not be possible up to now due to the significant reactions of local communities, which do not accept to be removed in new locations in order to facilitate the operation of the new hydropower station.

The development of hydropower stations is indispensable for achieving the international commitments of the country. Directive 2001/77/EC of the European Parliament and the Council of 27th September 2001 "For the promotion of electricity produced from renewable sources in the internal electricity market" provides in its annex for Greece an indicative target coverage from renewable energy sources including major hydropower projects, of 20.1% as a percentage of gross domestic energy[1] consumption in 2010. This target is consistent with the country's international commitments under the Kyoto Protocol signed in December 1997 under the agreement of the United Nations Framework on Climate Change [5].

The Kyoto Protocol predicts for Greece the retaining of the growth rate in 2008–2012 of CO_2 and other gases that exacerbate global warming by 25%, compared with the base year – 1990. The installed capacity requirements of RES (including large hydropower projects) for 2010 to achieve the goal are shown in Table 1 [27].

As already mentioned, a hydropower plant is characterized as small if its rated power is less than 10 MW. Kaldellis (2007) [25] states that the first SHP plant which has been operating in Greece since 1927 is the one of Glafkos (1.6 MW) located in N. Peloponnesus, while during almost at the same period of time (1929) the SHP station of Vermio (1.8 MW) has been also erected in central Macedonia. Up to 1994 only 8 small hydropower stations belonging to the State-controlled Greek Public Power Corporation (PPC) had been operating (total rated power: 42.8 MW).

[1] Mean annual production of electricity, including domestic production plus imports minus exports.

Table 1
Requirements for the installation of RES to achieve the targets for year 2010.

	Requirements on installed capacity in 2010 (MW)	Percentage contribution per type of RES in 2010
Wind farms	3648	10.67%
Small hydropower plants	364	1.52%
Large hydropower plants	3325	6.37%
Biomass	103	1.13%
Geothermal	12	0.14%
Photovoltaic	200	0.28%
Total	7652	20.11%

Source: Ref. [27].

The country's mainland (more precisely the west part) possesses a significant hydropower potential which is up to now only merely exploited. This, when combined with the significant opposition on behalf of local communities towards the installation of new LHPs, highlights small hydropower stations as one of the most attractive opportunities for further utilization of the available hydro potential.

The climatic and topographic conditions in Greece favor the development of SHP stations. It is important to mention that the topography in combination with the relative high precipitation facilitates the applications of similar power stations.

Let us further highlight the large number of rivers crossing mainland of Greece and ending up in the Aegean Archipelago, with the most important among them being Evros, Nestos, Strimon, Axios, Penios, Arachtos, Acheloos, Sperchios among many others.

According to Kaldellis [11] the available local hydropower potential is promising and can substantially contribute to the accomplishment of the national-EU target to cover 21% of the corresponding electricity consumption from renewable resources.

Following application of the law 2244/94 that permits private investors to participate in the installation of SHP stations, a large number of private companies have officially expressed their interest in creating small hydropower (SHP) stations throughout Greece. Especially over the last decade there has been an increased interest on the part of investors in this sector. In this context, a number of almost 40 new private SHP stations have been installed between 2000 and 2005.

However, up to now – contrary to expectations – a relatively small number of projects have been realized, mainly due to decision making problems, like the administrative bureaucracy and the absence of a rational water resources management plan. Moreover, cost of obtaining the required licensing (hydrological, approvals for water, construction of plant and land rights) can be up to €30,000, an amount which may be lost by the investor in case where the authorization is denied [25,20].

Two are the main factors that slow down the installation of new small hydropower stations. The first and most important is the administrative bureaucracy as a result of which the process of obtaining the necessary license becomes very long (about 3 years). Another important factor is the lack of a comprehensive national plan of water management. Many suitable sites for the installation of SHP stations remain unexploited due to the unclear situation of water potential since that municipalities and rural cooperatives state exclusively or preferential rights to existing water resources. Municipalities and rural cooperatives are putting pressure on plans for the use of the available water resources through their political influence.

Given the relatively small size of these plants, the same limited budget and lack of interest on the part of major energy companies, it is understandable the direction in this area of small private companies with limited socio-economic impact at national level. These small companies often lack the expertise and equipment to optimize their factories. In terms of economies of scale, only the SHP stations, which are located along a river, can benefit. As a result of all these, the construction time is long and the initial budget is often exceeded. Moreover, in many cases the plants are exaggerating the size required because the provided grants depend on the installed capacity, not energy efficiency. In these cases, SHP does not operate for a considerable time because of the low quantity of available water [25].

There are two categories of investors according to the Greek Regulatory Authority for Energy [28]. The first is investors with an authorized installation license and the second is investors who have filed an application and are awaiting for the evaluation (positive or negative) from the RAE. The evaluation of any preliminary draft for SHP installation is made by taking into account parameters such as environmental issues, installation of plant and property rights to water resources, plant safety, and reliability of the standard required documents. Then the technical-economic parameters for the viability of the investment are examined [25].

Small hydropower stations in Greece have very good technical-economic performance and thus have a promising future. They are characterized by high economic efficiency and the slow pace of their construction is contradicted by the considerable interest on the part of investors.

According to the latest figures of the Hellenic Transmission System Operator (HTSO) (March 2009) [29] in Greece there are 80 SHP stations installed with a capacity of 170.08 MW (Table 2). Most SHP stations are located in Central Macedonia, Central Greece, Epirus and Thessaly (Table 2). There are also under licensing several other projects with a total rated power of 450 MW [28].

Table 3 shows the chronological order of the installed power of SHP stations by prefecture for the 5-year period 2004–2009. Note that in this period the total capacity has almost quadrupled. Also we observe a disproportionate increase in power by region. In some regions, e.g. Eastern Macedonia and Thrace, installed power remains stable while in others such as Western Greece is doubled, whereas the biggest growth is in Epirus and central Macedonia where nearly quintupled their power.

The largest small hydropower stations belong to PPC, while the rated power of the largest private station is 4.5 MW.

The available small hydro potential in Greece is quite high, hence there are many suitable locations in various prefectures for developing new stations. Thus, there is an increased investors' interest regarding the construction and operation of small and mini hydropower plants [30,25].

The majority of new SHP stations planning to be constructed will be located in Epirus, central Greece and Macedonia [25]. If all these stations are to be implemented, the contribution of SHPs in the national electricity generation should attain the value of 5%,

Table 2
Number and rated power of SHP stations in operation by prefecture (up to March, 2009).

Regions	Number of SHP stations	Power (MW)
Eastern Mac. and Thrace	1	0.94
Attica	1	0.63
Western Greece	7	18.75
Western Macedonia	3	4.47
Epirus	14	44.99
Thessaly	9	20.39
Central Macedonia	27	45.21
Peloponnese	3	3.99
Central Greece	15	30.71
Total	80	170.08

Source: Hellenic Transmission System Operator (HTSO) [29].

Table 3
Installed power (MW) by region of SHP stations in operation in the grid for the years 2004–2009.

	December 2004	December 2005	December 2006	December 2007	December 2008	March 2009
Eastern Mac. and Thrace	1	1	1	1	1	1
Attica	–	–	–	–	1	1
Western Greece	8	8	9	9	19	19
Western Macedonia	–	–	1	1	4	4
Epirus	9	11	24	34	45	45
Thessaly	5	5	5	6	10	20
Central Macedonia	10	10	16	24	45	45
Peloponnese	1	1	2	4	4	4
Central Greece	9	12	16	17	29	31
Total	43	48	74	96	158	170

Source: HTSO.

strongly improving the national efforts to meet the 2001/77 EU Directive target.

4. Research methodology

4.1. Study area

The study was conducted in the prefecture of Ioannina in Epirus region (Map 1) during spring of 2010. According to the 2001 census, the population of the region numbers 161,027 people and compared with the previous census of 1991 there is an increase of 7.6%. The prefecture of Ioannina, mainly a mountainous region rich in water resources, collects 1.5% of the population and produces 1.4% of the country's GDP. In 2004 per capita GDP of Ioannina was about 91% of the country's average, while in 2000 only 85%. In terms of per capita GDP of 2004 the prefecture ranked in 11th place among the provinces in the country. The participation of the prefecture in the country's GDP increased marginally from 2000. In 2004 agriculture represented the 4.3% of GDP produced in the prefecture, the industry the 24.7% and the 70.9% were services. Ioannina is third in cheese production and first in meat production nation-wide [31].

We have chosen this particular region due to the impressive development of SHPs in recent years, leading to an impressive number of 36 in operation or license-authorized SHPs in the region, of a total rated power of 94.6 MW.

4.2. Questionnaire

This survey was conducted using a structured questionnaire and the method of personal interviews. The personal interview is one of the best ways of collecting statistics and is used frequently in polls [32–35]. In designing the questionnaire we have taken into account the relevant literature on the multiple effects of SHP stations (social, economic, developmental, environmental) [17,36–41].

Map 1. Prefecture of Ioannina.

In particular, the purpose of the study is to investigate the attitudes of citizens of the prefecture of Ioannina on the impact of the establishment and operation of SHP stations in the development of the prefecture and their quality of life, thus highlighting the potential of cross-contribution of SHPs to the local production and social system and environmental balance. Specifically, emphasis was laid on the following topics:

- The degree of public knowledge regarding SHP energy applications.
- The public awareness about environmental, developmental and economic impacts of small hydropower energy.

The questionnaire consisted of fix-response questions, covering various areas relating to respondents' attitudes towards SHP stations, perceptions of benefits and losses brought by SHP stations, knowledge concerning SHP stations and general environmental issues. Moreover, socio-demographic data of the respondents was collected (gender, age, educational level, income, occupation). A detailed description of the questionnaire's variables can be found in Appendix B. For the main part of the questionnaire, five-point or three-point scales were used for the evaluation of the given statements. The answering possibilities for the five-point scale were: ''Absolutely Disagree'' (1), ''Disagree'' (2), ''Neither Agree nor Disagree'' (3), ''Agree'' (4), ''Absolutely Agree'' (5). The answering possibilities for the three-point scale were: ''Low Priority'' (1), ''Medium Priority'' (2) and ''High Priority'' (3).

4.3. Sampling – statistical methodology

Simple random sampling was the sampling method selected, due to its simplicity and the fact that it requires a minimal knowledge of the population compared to any other method [42–45].

The ''population'' under study is the total number of households in the Ioannina prefecture. The Simple Random Sampling presupposes the existence of a complete list (sampling frame) with the information for the population without omissions or repetitions [46]. The sampling framework used involved lists of consumers of household electricity. These lists were considered the most appropriate choice, since almost 100% of households in the prefecture under research use electricity.

Using households is a classic example of using groups of people as a sampling unit, instead of individual persons. This is a preferred solution in certain cases, since it is the most convenient and less costly method. The selection process for the respondents (from a household chosen at random) was organized so that the same family member would not always be chosen (i.e. always the head of the family, a spouse, etc.) [45].

In order to estimate the sample size, the following simple random sampling formula is used:

$$n = \frac{t^2\,\hat{p}(1-\hat{p})}{e^2}$$

where $\hat{p} = \sum_{i=1}^{n}(p_i)/n$ is the estimate of population proportion that share a certain characteristic on one of the (categorical) variables in the survey, and e is the maximum acceptable difference (proportion of error we are prepared to accept) between the sampling proportion and the unknown proportion of the population. (We accept that $e = 0.05$, i.e. 5%).

Pre-sampling was conducted on a sample size of 50 persons to estimate the variable with the greatest variance under the desired selected error, while the rest are estimated with a greater accuracy than was initially defined.

According to the pre-sampling the higher proportion value is $p = 0.49–0.50$, therefore $1 - p = 0.5$ and consequently the sample size selected was

$$n = \frac{t^2\,\hat{p}(1-\hat{p})}{e^2} = \frac{1.96^2\,0.5(1-0.5)}{0.05^2} = 384.16$$

We therefore accepted a sample size of 385 individuals (persons). The households in the sample were then precisely identified (full name and address) using tables of random digits. To the chosen households, personal interviews with a member of the family, which was randomly selected, were conducted. In cases occupants were not found or refused to answer, two more attempts were made to obtain their opinion. When this was not possible, we used the same procedure in order to select new sampling units.

Econometric analysis was carried out with the help of the statistical package SPSS 15.0 [47], including – besides the descriptive analysis of single items from the questionnaire – the analysis of qualitative variables of the questionnaire by the use of logistic regression analysis for attempting to identify possible socio-demographic characteristics affecting respondents' willingness to pay for small hydropower plant energy.

5. Results and discussion

5.1. Descriptive statistics

According to the entire sample analyzed (385 respondents), 258 were female (67%) and 127 male (33%) (Table A.1). Respondents' ages were mainly between 31 and 50 years old (≈70%), while 67 respondents (17.4%) were up to 30 years old and 49 (12.7%) between 51 and 60 years old (see Table A.1 in Appendix A). As regards the educational level of respondents, 41.3% (159 respondents) were educated to high or senior high school, and 54% (208 respondents) are of upper educational level (Table A.1). Their family income varied mainly between €15,001 and €20,000 (34.8%), with a large percentage of family incomes being between €10,001 and €15,000 (25.7%) and over €20,000 (26.2%) (Table A.1). The vast majority were employees (76.9%)—occupied in the private and public sector, whereas the rest of respondents were farmers, unemployed, freelancers and housewives (Table A.1).

Interviewees were asked about their opinion relative to some characteristics of their prefecture, ranging from their view on the quality of life to aspects concerning renewable energy sources.

First of all, concerning the question of quality of life (Table A.2), the respondents are divided, with almost half of them (50.4%) stating their agreement (fully agree or agree) that quality of life in prefecture of Ioannina is very good. On the other hand, a significant percent (27.8%) were disagreeing with this statement (the 21.6% were undecided).

Things are clearer when we come to the question concerning employment opportunities in the prefecture (Table A.2). People mentioned in their interviews at a 65.8% that agree or absolutely agree with the statement of no employment opportunities, with only a 14.5% favoring for the opposite. Accordingly, the vast majority (89.4%) of the people polled state that there is no industrial development in the prefecture (the opposite was stated by just the 3.9% of interviewed citizens).

In terms of the role RES play in their prefecture (Table A.2), there is a clear indication of the substantial lack of renewable energy recourses (RES) utilization, since the 68.8% of respondents stated that little or no development towards this type of energy source is present (only 5.2% stated otherwise).

On the contrary, the citizens' support for a progressive turn towards RES is clearly stated by the following question, concerning whether or not the future development of the prefecture should be based on renewable energy. Nearly 74% of the people polled expressed their general support for the future use of RES, while only 3.1% stated that future development should not be based on this type of energy (Table A.2).

In the present paper, emphasis was primarily laid on the assessment of public attitudes towards small hydropower stations. Even though general public surveys worldwide show a support towards a progressive energy policy, many residents feel severely limited in their quality of life by the actual or potential installation of hydropower stations. Among many arguments in this decade concerning the utilization of SHPs are on the one hand the changes of the landscape on local level, and on the other hand local economical and social benefits.

It is generally accepted that SHP installation and operation can create economic opportunities for local residents. Perceptions of local people in terms of potential economical benefits from the construction and operation of SHP stations in the prefecture of Ioannina showed that most respondents (71.5%) see economic gains for the local population from the establishment of SHP stations whereas only the 9.6% of respondents express the believe of no benefits (Table A.3). 63.4%, 28.8% and 7.8% of the respondents showed positive neutral and negative response to their agreement with the statement that construction and operation of SHP stations in the prefecture will ensure the availability of electricity in perpetuity (Table A.3).

The limited knowledge of citizens as concerns the environmental impacts of SHP stations in the prefecture they are established becomes evident from the fact that almost half of the respondents (46.5%) provided a neutral answer as concerns their opinion on whether or not SHP stations have a protective effect on preventing floods (Table A.13). Concerning the benefits of the prefecture of Ioannina by the enhancement of various local bodies through the SHP stations' social responsibility and sponsorship, 53.8%, 33.5% and 12.8% of respondents provided a positive, neutral and negative response (Table A.3).

Most respondents pointed out their skepticism associated with environmental concerns from SHP installations, since that 46.2% (summation of the answers "agree" and "absolutely agree") of citizens believe that an SHP will lead to significant environmental impacts, such as reduction in aesthetics of landscape and environment in general (25.7% of respondents do not support this opinion) (Table A.3).

This result is verified by the relative literature. It is generally acknowledged both by the public and by experts [23] that SHP stations have (larger or smaller) impact on the environment. It is also agreed among experts that one of the most critical impacts of small hydropower is the one of distortion of fish fauna living in the river of the erected station. There are even situations where species have disappeared due to problems with the fish passes, especially

for salmon [48], thermal pollution, and increased turbidity among others.

The answers of respondents in the statement concerning the possibility of reduction of fish fauna in the prefecture, due to the installation of a SHP station are more or less uniformly distributed (36.6%, 23.9% and 39.5% were the positive, negative and neutral answers, respectively) (Table A.3). The respondents are more confident that the fish fauna of the prefecture where an SHP is located is disturbed by the operation of the hydro plant (see Table A.18). Specifically, about half of them respond positively (45.4% agree or absolutely agree with the statement) whereas only the 17.7% answer "disagree" or "absolutely disagree".

The belief that installation of SHP stations in a prefecture significantly affects economical development (and development of the prefecture in general) is verified since that more than 75% of respondents (75.6%) answered that agree or absolutely agree with the statement that the construction and operation of a SHP could upgrade the networks of the prefecture (e.g. roads, telecommunications) (Table A.3).

Besides the already discussed benefits gained from a SHP stations' construction and operation, it is also supported by those in favor of RES that SHP stations can also promote new alternative (and also profitable) forms of tourism in the prefecture of erection of the plants. This opinion seems to find supporters in our study, since 55.1% of citizens responded positively on this issue (Table A.3).

It has been claimed that one of the main reasons SHP stations have not grown as expected especially in Greece, is the complex and bureaucratic administrative procedures to obtain licenses for commissioning a plant [25]. According to the information collected, this issue causes also diversity between respondents, as we look at their answers in the question concerning the procedures under which installment and deployment of an SHP station should be based. Specifically, 46.2% stated their agreement (agree or absolutely agree) with reducing the presently existing bureaucracy regarding the number of supporting documents one has to apply in order to obtain a permit to erect an SHP station, however, a significant part of respondents (28.8%) are against making quicker and simpler the licensing process. Also, 24.9% provided a neutral answer (Table A.3).

It is true today that in Greece there is a complex, bureaucratic and time-consuming system for a generation license, deployment and utilization of a SHP station. On the other hand, most citizens surveyed agree that legislation in relation to the construction of SHP stations should be more strict (66%), and people are quite sensitive to the environmental impacts of specific projects with only 10.9% disagreeing with the latter statement (Table A.3).

Keeping in mind that there is an almost constant minority (≈15%) of respondents that are negatively expressing views against SHP stations, this group is also present in the results of the statement concerning the development of ecotourism in the prefecture after the erection of an SHP station (18.7% disagrees that SHP station operation could be a pole of development). However, again, the majority favors the specific statement (55.1%), while once again a significant part does not express positive or negative opinion (26.2%) (Table A.3).

The results are similar in the following question. 50.9%, 15.9% and 33.2% of citizens respond positively, negatively and neutral, respectively, to the agreement with the statement that operation of SHP stations reduces emissions of carbon dioxide (Table A.3).

Finally, the lack of information on behalf of the public becomes apparent by the clear absence of knowledge when asked to state their opinion concerning economical benefits of the local community gained by the council of the city from potential investors of SHP stations (67.5% answered "don't know") (Table A.3).

In the sequel of the questionnaire, questions designed to evaluate and rank the priorities local people believe that should be given in future potential benefits from installment of SHP stations in their prefecture (Table A.4). More analytically, in terms of the preferences of respondents, there is a clear vote on priorities associated with protection and preservation of the environment, stressing in this way the increased public interest and awareness for environmental impacts of small hydropower energy.

Specifically, respondents state that it should be given high priority to the protection of nature (92.2%), and to the protection of air, water and soil (89.6%). Economical and social benefits are following, with people stating that high priority should be given in the creation of employment opportunities (85.2%), in the production of electrical energy (78.2%), and in the financial support of the local community (77.4%). The high priority for creating an attractive and beautiful landscape was answered by the 70.9% of respondents. The lower priority was given to recreation for the local population (high priority: 39.5%, medium priority: 51.7%, low priority: 8.8%).

In the last part of the questionnaire, local people's perceptions were investigated, concerning their potential behavior in case of facing the event of higher local electricity expenditures due to the contribution of SHP stations' electrical power in the total electricity costs.

Hydropower, in general, can be characterized as a capital-intensive investment since it requires a heavy initial investment cost.[2] In other words, hydropower can appear expensive in the early years even though it is cheap in the years to follow [49]. As a consequence to this, high tariffs in the first 10–15 years of utilization of SHP stations are usually observed. However, once investment costs are repaid, cost of hydropower drops dramatically, and becomes stable over time and moreover is not subject to fuel fluctuations. Additionally, lifetime of a SHP station can rise up to 100 years. In this respect, public support and attitude play a key role towards the possible initially augmented selling prices of SHP-produced electricity.

Under this perspective, in our questionnaire the respondents were asked to state whether they would be WTP for obtaining electricity from SHP stations. Specifically, two questions were asked to citizens, one investigating their willingness to pay higher PPC prices, where the percentage of electricity from SHP stations is analyzed, and the other investigating willingness to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy in the future. More specific, during the survey, respondents were asked the following questions: "*are you willing to pay higher PPC prices, for increased SHP stations contribution in electricity generation*" and "*are you willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future?*". The respondent had to pick from five possible answers, namely "Absolutely Disagree", "Disagree", "Neither Agree nor Disagree", "Agree" and "Absolutely Agree".

We have chosen the specific items due to that PPC currently owns the 96% of installed power capacity in Greece which comes from lignite, oil and hydroelectric plants, gas plants, and wind and solar farms and therefore plays a key role in energy and national economy. Also, in recent years many municipal enterprises have implemented and operate small hydroelectric stations as well as other facilities for the generation of electricity from renewable energy sources, contributing in this way to energy supply in their area.

The results of the responses are shown in Table A.5.

As we observe, the research results showed that a large percentage of respondents were willing to pay higher municipal

[2] The EU average initial investment cost for SHP stations ranges between 1200€/KW to 3500€/KW.

taxes for creating municipal SHP stations (agree or absolutely agree: 40.5%). More than 46% of respondents however expressed a negative reaction. By contrast, only 15.8% of the respondents were willing to pay higher amount of money through extra charges in PPC bills (Notice also that none of the respondents absolutely agrees with the question). The percentage of individuals who refused the scenario was more than 60% (disagree or absolutely disagree).

These results show a clearly preference of respondents on financing construction costs rather than paying higher electricity prices for a specific time period, during the early years of SHP employment.

5.2. Tests of independence

Besides the descriptive analysis of single items from the questionnaire, the qualitative variables of willingness to spend an increased amount of money for electricity obtained from SHP stations were related by means of a chi-square test [50] with socio-demographic variables, and in addition, the contingency coefficient (CC) for each statistically significant comparison was calculated in order to determine the strength of the association.

As concerns the question investigating the citizens' willingness to pay higher PPC prices for increased SHP stations contribution in electricity generation, the distribution of the willingness to pay higher PPC prices by gender (Table A.6) reveals that male citizens are more willing to pay (χ^2 = 13.47, df = 3, p-value = 0.004 < 0.05, CC = 0.184, p-value = 0.004). A statistically significant relationship was also observed between the WTP of the citizens of prefecture of Ioannina and their age (χ^2 = 80.377, df = 9, p-value < 0.001, CC = 0.416, p-value < 0.001). Younger citizens are more willing to pay higher PPC prices for increased SHP stations contribution than older citizens (Table A.7). Also, the educational level of citizens seems to be related to favorable or no favorable attitude (χ^2 = 50.592, df = 6, p-value < 0.001, CC = 0.341, p-value < 0.001). It is obvious from the inspection of contingency Table A.8, that citizens of middle and upper educational level are more willing to pay in comparison to citizens of lower education, showing that they have greater environmental awareness and understand better the broader role of SHP stations, being rather better well-information.

There also seems to be an association between the family income and WTP higher PPC prices (χ^2 = 69.106, df = 9, p-value < 0.001, CC = 0.39, p-value < 0.001). In addition, it also seems that higher incomes are more positive to the contribution of SHP stations to the integrated development of their region. Citizens of higher incomes are more agreeing in WTP than citizens of lower income (≤€10,000). Finally, the acceptance of WTP higher PPC prices is related statistically significantly to the citizens' occupation (χ^2 = 96.702, df = 12, p-value < 0.001, CC = 0.448, p-value < 0.001) (Table A.10).

When we come to the results obtained using the chi-square test to compare proportions of answers on the question of willingness to pay higher municipal taxes for the construction and operation of municipal SHP stations between the various demographic groups, we see that the acceptance of higher municipal taxes is also related statistically significantly to gender (χ^2 = 15.187, df = 4, p-value = 0.004 < 0.05, CC = 0.195, p-value = 0.004), age (χ^2 = 64.171, df = 12, p-value < 0.001, CC = 0.378, p-value < 0.001), education (χ^2 = 67.307, df = 8, p-value < 0.001, CC = 0.386, p-value < 0.001), family income (χ^2 = 88.637, df = 12, p-value < 0.001, CC = 0.433, p-value < 0.001) and occupation (χ^2 = 103.585, df = 16, p-value < 0.001, CC = 0.46, p-value < 0.001).

Again, citizens of lower education, and low income are the less reluctant to pay increased taxes.

A favorable attitude towards WTP is also more common among male citizens. Disaggregated by age, we also observe significant differences in WTP behavior, however things are not so clear as is the case with the question of increased PPC prices.

From the contingency table (Table A.16) between the proportions of answers of the two WTP questions, we see first of all that there is a significant part of respondents (68 out of 385, or 17.7%) that absolutely disagrees on paying in any of the two proposed scenarios for obtaining electricity from SHP stations. Respondents who generally disagree (disagree or absolutely disagree) are up to 137 (or 35.6% of total sample surveyed), whereas those who generally agree (agree or absolutely agree) in both scenarios are only 56 (or 14.5% of total sample surveyed). A statistically significant relationship is also observed for the association between the two WTP variables (χ^2 = 233.804, df = 12, p-value < 0.001, CC = 0.615, p-value < 0.001).

Finally, the association between the local residents' acceptance for paying higher PPC prices and their expectations as concerns the elevation of income of local population through the creation of new job positions is also statistically significant (χ^2 = 65.067, df = 12, p-value < 0.001, CC = 0.38, p-value < 0.001) (Table A.17). The same results hold for the association between the publics' acceptance for paying higher municipal taxes and the latter issue (χ^2 = 136.221, df = 16, p-value < 0.001, CC = 0.511, p-value < 0.001) (Table A.18).

5.3. Willingness to pay for small hydropower plant energy

In the sequel, logistic regression analysis [51] was conducted in order to examine which of the scales (exploratory variables) has the greatest power in predicting respondents' potential willingness to pay for small hydropower plant energy, as was measured through the two questions included in our study.

Thus, two separate logistic regression models were fitted to the data, with dependent variables being the "willingness to pay higher PPC prices, for increased SHP stations contribution in electricity generation" and "willingness to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future" variables, respectively.

For convenience of interpretation and presentation of the results of the analysis, categories "agree" and "absolutely agree" were suppressed to one category of positive answer (agreement) whereas the same was done for the negative categories (disagreement). The "neutral" category (neither agree nor disagree) was also included in the analysis.

To identify those factors that influence statistically significantly the two dependent variables, we have chosen to use socio-demographic characteristics of the respondents as the predictor variables. More specifically, we have chosen for the initial fit of the logistic regression model as predictors, socio-economic variables: gender, age, educational level, income and occupation.

For modeling the two multinomial categorical responses each one consisting of three categories (1: WTP, 2: not WTP, 3: neither agree nor disagree) we assume dependent variables $y_{ij} = (y_{i1}, y_{i2}, y_{i3})^t$ ($i = 1, 2, \ldots, 385$; $j = 1, 2, 3$) following a multinomial distribution with probabilities $\pi_i = (\pi_{i1}, \pi_{i2}, \pi_{i3})^t$ and a set of k predictor variables $\{x_1, x_2, \ldots, x_k\}$. In other words, π_{ij} denotes the probability that respondent i chooses the alternative category answer j. Then, by taking category "WTP" (say denoted by j^*) as the baseline category, each one of the two multinomial logistic regression models can be expressed as:

$$\log\left(\frac{\pi_{ij}}{\pi_{ij^*}}\right) = x_i^t \beta_j \quad (j \neq j^*)$$

where $\pi_{ij} = \exp(x_i^t \beta_j)/(1 + \sum_{k \neq j^*} x_i^t \beta_k)$ denotes the jth category probability, $\pi_{ij^*} = 1/(1 + \sum_{k \neq j^*} x_i^t \beta_k)$ the baseline-category probability, the $\mathbf{x}$ vectors $(\mathbf{x}_1, \mathbf{x}_2, \ldots, \mathbf{x}_k, \ldots, \mathbf{x}_m)$ are the categorical

explanatory variables (covariates), and the β's are the corresponding vectors of coefficients ($\beta_1, \beta_2, \ldots, \beta_k, \ldots, \beta_m$). By setting the last set of coefficients to null, that is $\beta_m = 0$, the coefficients β_k ($k = 1, \ldots, m-1$) represent the effects of the $\mathbf{x}$ variables on the probability of choosing the kth alternative over the last alternative.

In the above expressions of the models, the logit was used as the model's link function.

The kth element of parameter β_j can be interpreted as the increase in log-odds of falling into category j vs. category j^* resulting from a one-unit increase in the kth covariate, holding the other covariates constant.

In the previously described multinomial logit regression models we have designated as predictor groups the levels "Disagree in WTP" and "Neither Agree nor Disagree in WTP", while as reference (baseline) category in both models we have chosen the positive answers of respondents ("Agree in WTP"). For the adaptation of the final model and estimation of the beta coefficients, Maximum Likelihood method was utilized.

Tables 4 and 5 show the results of the analysis. Specifically, Table 4 shows for the first logistic model the values of the coefficients of independent variables in the logistic model accompanied by the statistical significance of coefficients, derived by the Wald type test. In the last column, the odds ratios of the model are presented for each one of the predictor variables separately. In the case of the categorical explanatory variables, the above ratio is the ratio of probabilities of the [Disagree in WTP] and [neither Agree nor Disagree in WTP], using as reference group the [Agree in WTP] category.

The final logistic regression model, for the [WTP higher PPC prices] is the following:

$$\log\left(\frac{\text{odds(Disagree in paying higher PPC prices)}}{\text{odds(Agree in paying higher PPC prices)}}\right)$$
$$= -1.787 \times [\text{Education} = \text{"middle"}] - 2.525 \times [\text{Gender}$$
$$= \text{"male"}] - 3.623 \times [\text{Age} = \text{"} \leq 30\text{"}] - 2.897 \times [\text{Age}$$
$$= \text{"31 - 40"}] + 4.099 \times [\text{Income}$$
$$= \text{"10,001€ - 15,000€"}] + 1.928 \times [\text{Income}$$
$$= \text{"15,001€ - 20,000€"}]$$

for the contrast between reference group and the "Disagree" group, and

$$\log\left(\frac{\text{odds(Neither Agree nor Disagree in paying higher PPC prices)}}{\text{odds(Agree in paying higher PPC prices)}}\right)$$
$$= -2.198 \times [\text{Education} = \text{"middle"}] - 3.099 \times [\text{Gender}$$
$$= \text{"male"}] + 4.629 \times [\text{Income}$$
$$= \text{"10,001€ - 15,000€"}] + 3.301 \times [\text{Income}$$
$$= \text{"15,001€ - 20,000€"}]$$

for the contrast between reference group and the "Neither Agree nor Disagree" group.

As it follows from Table 4, the age of the respondent is a significant factor for the willingness to pay higher PPC prices for increased SHP stations contribution in electricity generation produced by SHP stations, at a 1% level of significance. Indeed, if we look at the Table, we see that younger citizens (≤30 y.o.) are more willing to pay compared to older citizens. The odds of disagreeing to WTP rather than agreeing is decreased at about 97.3% and 94.5% being up to 30 years old and between 31 and 40 years old, respectively.

Accordingly, males are more willing to pay, when compared to females (beta = −2.525, p-value < 0.05) as the "Agree" and "Disagree" comparison reveals.

Table 4
Parameter significance tests (reference group: "Agree in paying higher PPC prices").

Parameter	Beta coefficient	p-value	Odds ratio (exp(B))
DISAGREE			
Intercept	−16.483	0.995	
Educational level (ref.: upper)			
Lower	0.365	0.999	
Middle	−1.787	0.001***	0.167
Gender (ref.: female)			
Male	−2.525	<0.001***	0.08
Age (ref.: 51–60 y.o.)			
≤30	−3.623	0.001***	0.027
31–40	−2.897	<0.001***	0.055
41–50	31.994	0.983	
Income (ref.: €20,000+)			
≤€10,000	39.922	0.991	
€10,001–€15,000	4.099	<0.001***	60.259
€15,001–€20,000	1.928	0.001***	6.875
Occupation (ref.: unemployed)			
Farmer	1.415	0.999	
Housewife	32.804	0.995	
Employee	19.907	0.994	
Freelancer	16.57	0.995	
NEITHER AGREE NOR DISAGREE			
Intercept	−154.541	0.975	
Educational level (ref.: upper)			
Lower	76.785	0.989	
Middle	−2.198	<0.001***	0.111
Gender (ref.: female)			
Male	−3.099	<0.001***	0.045
Age (ref.: 51–60 y.o.)			
≤30	42.288	0.977	
31–40	43.965	0.976	
41–50	78.411	0.999	
Income (ref.: €20,000+)			
≤€10,000	26.266	0.994	
€10,001–€15,000	4.629	<0.001***	102.4
€15,001–€20,000	3.301	<0.001***	27.129
Occupation (ref.: unemployed)			
Farmer	11.573	0.998	
Housewife	154.417	0.981	
Employee	110.436	0.979	
Freelancer	106.212	0.98	
−2 Log likelihood	182.635		
Chi-square test	300.232	<0.001	
Nagelkerke's R Square	0.639		
Cox and Snell R Square	0.542		

*** Coefficient is significant at a 1% significance level.

These categories of respondents (i.e. younger respondents, males) are more sensitive to environmental protection, as they believe that SHP stations contribute to its protection by reducing considerably the emissions of harmful to health pollutants caused by burning fossil fuels (coal, oil, gas) and for this are more willing to pay higher prices for increased electricity produced from SHP stations and distributed by the PPC.

The less willing to pay, as concerns the respondents' income are those of higher incomes. Indeed, the odds of being in the group of those disagreeing in WTP, rather than in the agreement group is increased by a factor of 60.26 by being in the "€10,001–€15,000" income category, rather than being in the "€20,000+" income category.

Educational level is also included in the final model, indicating that between those of middle and upper education there is a significant negative shift of willingness to pay higher PPC prices

Table 5
Parameter significance tests (reference group: "Agree in paying higher municipal taxes").

Parameter	Beta coefficient	p-value	Odds ratio (exp(B))
DISAGREE			
Intercept	−2.73	0.004***	
Educational level (ref.: upper)			
Lower	3.255	0.015**	25.926
Middle	0.451	0.087*	1.57
Gender (ref.: female)			
Male	−0.404	0.173	
Age (ref.: 51–60 y.o.)			
≤30	0.941	0.082*	2.563
31–40	0.27	0.521	
41–50	0.567	0.2	
Income (ref.: €20,000+)			
≤€10,000	1.927	0.019**	6.871
€10,001–€15,000	0.335	0.413	
€15,001–€20,000	0.445	0.167	
Occupation (ref.: unemployed)			
Farmer	0.817	0.439	
Housewife	20.887	0.997	
Employee	2.131	0.006***	8.427
Freelancer	0.45	0.588	
NEITHER AGREE NOR DISAGREE			
Intercept	−91.414	<0.001***	
Educational level (ref.: upper)			
Lower	−12.98	0.998	
Middle	0.677	0.127	
Gender (ref.: female)			
Male	1.744	<0.001***	5.721
Age (ref.: 51–60 y.o.)			
≤30	18.582	0.987	
31–40	17.324	0.988	
41–50	35.261	0.999	
Income (ref.: €20,000+)			
≤€10,000	36.986	0.986	
€10,001–€15,000	18.052	0.987	
€15,001–€20,000	−0.519	0.35	
Occupation (ref.: unemployed)			
Farmer	21.854	0.996	
Housewife	20.75	0.998	
Employee	55.081	0.999	
Freelancer	18.531	0.996	
−2 Log likelihood	322.451		
Chi-square test	183.350	<0.001	
Nagelkerke's R square	0.440		
Cox and Snell R square	0.379		

* Coefficient is significant at a 10%significance level.
** Coefficient is significant at a 5%significance level.
*** Coefficient is significant at a 1% significance level.

(beta = −1.787, p-value = 0.001 < 0.05). Occupation was not found to be a significant factor for the dependent variable.

Respondents of higher income groups and middle/high educational levels seem to be less environmentally sensitive than other categories of respondents, maybe due to the fact that those groups do not often come into contact with the environment because of their lifestyle.

Similar results were found when we come to the comparison between the "neutral" category and the reference category (positive).

As concerns the model's adequacy, the chi-square value of the model (300.232, p-value < 0.001) indicates that logistic regression is very meaningful at the 5% level of significance. The Negelkerke's pseudo R square was 0.639, and the Cox and Snell R-square 0.542. The model proved to exhibit (moderately) good predicting power, since the prediction accuracy derived by the classification table was 68.6%.

When we come to the second logistic regression model, things are different as regards the interpretation of the model (Table 5).

While gender does not seem to differentiate between those who agree to pay higher municipal taxes and those against, on the other hand the odds of being in the neutral category rather than agreeing to pay is increased by a factor of 5.72 by being male rather than female (beta = 1.744, p-value = 0.001 < 0.05). Also, the income and educational level are both statistically significant predictors of the response variable. Respondents of lower incomes (≤€10,000) are less willing to pay higher municipal taxes (beta = 1.927, p-value = 0.019 < 0.05) in comparison to respondents of higher incomes.

Generally, citizens of higher incomes are much less affected by increases in municipal taxes and generally from indirect taxes and therefore can more easily contribute to the increase in municipal taxes for the construction and operation of municipal SHP stations.

Accordingly, the odds of disagreeing in paying rather than agreeing are increased by a factor of 6.871 by belonging to the lowest income category. The model also indicates that those of lower education are less willing to pay than those of higher education (beta = 3.255, p-value = 0.015 < 0.05) at a 5% level of significance. Odds of not WTP vs. WTP are increased by a factor of 26 by belonging to low educational level.

Statistically significant association between WTP and middle/higher educational level was also found, but to a 10% level of significance (beta = 0.451, p-value = 0.087 < 0.1). Odds of not WTP vs. WTP are increased now by only 1.57 by belonging to middle educational level, rather than to higher educational level.

In contrast to the first logistic model, we have an indication that younger citizens are less willing to pay for construction and operation of SHP stations through municipal taxes (beta = 0.941, p-value = 0.082 < 0.1) at a 10% level of significance. Indeed, the odds for respondents below 30 y.o. to older respondents (>30 years old) are 2.56, which corresponds to a 156% increase of willingness to pay higher municipal taxes for younger citizens.

In many cases, the involvement of municipalities in the business sector in Greece in the last decades has proven to be non-productive and effective and is usually characterized by mismanagement. Younger citizens have found that generally municipal businesses are not productive and effective and believe that the same will happen with the municipal SHP stations, thus refusing to pay higher municipal taxes for their construction and operation.

Although occupation of the local citizens was not found to affect statistically significantly the willingness to pay higher PPC prices, here we find that WTP higher municipal taxes is partly affected by occupation. Indeed, being an employee is a significant factor for willingness to pay (beta = 2.131, p-value = 0.006 < 0.05) at the 5% level of significance, and as suggested by the model, the probabilities (odds) of not WTP is increased by a factor of 8.427 in case of employees when compared to all other professions. The model's equations are given by:

$$\log\left(\frac{\text{odds(Disagree in paying higher municipal taxes)}}{\text{odds(Agree in paying higher municipal taxes)}}\right) = -2.73 + 3.255 \times [\text{Education} = \text{``lower''}] + 0.451 \times [\text{Education} = \text{``middle''}] + 0.941 \times [\text{Age} = \text{``} \leq 30\text{''}] + 1.927 * [\text{Income} = \text{``} \leq 10,000€\text{''}] + 2.131 \times [\text{Occupation} = \text{``employee''}]$$

and

$$\log\left(\frac{\text{odds(Neither Agree nor Disagree in paying higher municipal taxes)}}{\text{odds(Agree in paying higher municipal taxes)}}\right) = -91.414 + 1.744 \times [\text{Gender} = \text{``male''}]$$

for the contrast between the reference group and the "Disagree" group, and for the contrast between the reference and the "Neither Agree nor Disagree" group, respectively.

Employees seem more willing to pay higher municipal taxes to build municipal SHP stations, presumably due to that for each month they have a fixed salary, hence they can do better planning.

The chi-square value of the model (183.35, p-value < 0.001) indicates that logistic regression is very meaningful at the 5% level of significance. The Negelkerke's pseudo R square was 0.44, and the Cox and Snell R-square 0.379. The model proved to exhibit reduced predicting power in comparison to the previous logistic model, since the prediction accuracy derived by the classification table was only 56.4%.

6. Conclusions

It is generally acknowledged that the development of small hydropower around the world is on the increase. Governments, and wider political unions such as the EU are seeking to find new ways in promoting renewable energy sources, among them and the small hydropower development.

The current article has attempted to assess the public attitude towards SHP energy and to evaluate SHP development in Greece, based on the results of a questionnaire survey conducted in the prefecture of Ioannina, Greece.

The findings of the current study revealed that – although attitude of the public varied – citizens generally have a favorable attitude and interest towards renewable energy sources such as energy from small hydropower stations. However, the most troublesome outcome of this study is the existence of a specific minority that is strongly against SHP construction and operation, disregarding any potential benefits of these projects.

Environmental impacts, as normally expected, were the most profound reasons for protest and negative attitudes against the utilization of electricity from small hydropower stations. To this end, benefits of small hydropower energy should be more effectively communicated to the public, in order to gain a wider support including those claiming that small hydropower stations will have a negative effect in their prefecture after installation of SHP stations (e.g. environmental effects, cost effects).

Especially, attractive features of SHP energy such as reduction of Greenhouse gases, creation of new biotopes and new opportunities for developing ecotourism should become more familiar to the public, currently found to be confusing the limited negative impacts of SHP stations with major negative environmental impacts of large hydropower stations.

Another finding was that there is a substantial lack of knowledge in terms of some characteristics of hydropower energy. For instance, 46.5% of people surveyed answered "Do not know" to the question on whether or not SHP stations have a protective effect on preventing floods. Thus, among the primary conclusions drawn by the specific survey, is the necessity of additional public information regarding SHP energy.

A strong connection between the public acceptance and the economical gains of SHP stations utilization became also evident from this study. The local residents want to participate in terms of economic benefits instead of just bear costs like changes of the landscape. Therefore, in order to limit potential conflicts and negative opinion of local citizens it is of significant importance to establish a reasonable price of small hydropower electricity for the consumer. The cost of electricity should be limited within local people's bearing capacities.

Publicizing the fact that SHP energy can be the most cost-effective renewable energy source over time, while at the same time is an environmental friendly solution, able to contribute significantly to the solution of the energy demand problem of Greece is expected to encourage the public to enhance their participation in the purchase of SHP electricity.

Employment opportunities are also a key factor, as suggested by the results of the survey. To this end, various measures should be taken to ensure that local employment created directly or indirectly by SHP stations would be highest possible.

Finally, socio-economic characteristics, such as gender, age, income and education, are shown to have close connections with local people's attitudes towards SHP stations.

More specifically, the young ($\leq$30 years) and men are more willing to pay higher PPC prices for increased SHP energy contribution in electricity generation compared with elderly citizens, suggesting that the younger generation and men are more environmentally sensitive and probably better informed. The people of lower incomes and less education are less willing to pay higher dues to create municipal SHP stations.

In conclusion, the smooth operation of SHP stations depends to a large extent on the attitude of local communities towards them. The operation of a SHP station in everyday and practical level will prove the theoretical design in practice, thus contributing to the overall development of the region.

The establishment and operation of a SHP station requires adjusting of conflicts between different beliefs or opinions and interests of social groups (farmers, fishermen, domestic consumers of water, environmental organizations, private investors).

Generally, legislation alone will not bring the desired result as consumers-citizens hardly change well established habits, while the lack of information up to now contributed to the indifference of consumers-citizens for any systematic effort in the sector of RES.

Appendix A

Tables A.1–A.18.

Table A.1
Socio-demographic characteristics of respondents.

		Frequency	Percent
Gender	Male	127	33.0
	Female	258	67.0
	Total	385	100.0
Age of member of household	31–	67	17.4
	31–40	150	39.0
	41–50	119	30.9
	51–60	49	12.7

Table A.1 (*Continued*)

		Frequency	Percent
	Total	385	100.0
Level of education	Lower	18	4.7
	Middle	159	41.3
	Upper	208	54.0
	Total	385	100.0
Family income	€10,001–	51	13.2
	€10,001–€15,000	99	25.7
	€15,001–€20,000	134	34.8
	€20,000+	101	26.2
	Total	385	100.0
Occupation of member of household	Farmer	23	6.0
	Housewife	10	2.6
	Employee	296	76.9
	Freelancer	24	6.2
	Unemployed	32	8.3
	Total	385	100.0

Table A.2
Opinion relative to characteristics of the prefecture.

		Frequency	Percent
Quality of life is very good	Absolutely disagree	4	1.0
	Disagree	103	26.8
	Neither agree nor disagree	83	21.6
	Agree	138	35.8
	Absolutely agree	57	14.8
	Total	385	100.0
There are no employment opportunities	Absolutely disagree	4	1.0
	Disagree	52	13.5
	Neither agree nor disagree	76	19.7
	Agree	165	42.9
	Absolutely agree	88	22.9
	Total	385	100.0
Great industrial development	Absolutely disagree	122	31.7
	Disagree	222	57.7
	Neither agree nor disagree	26	6.8
	Agree	15	3.9
	Absolutely agree	122	31.7
	Total	385	100.0
The development of the prefecture relies on renewable energy	There is no development	168	43.6
	Little development	97	25.2
	Large development	20	5.2
	DK/DA	100	26.0
	Total	385	100.0
The future development of the prefecture should be based on renewable energy	There is no development	12	3.1
	Little development	39	10.1
	Large development	284	73.8
	DK/DA	50	13.0
	Total	385	100.0

Table A.3
Public attitudes towards small hydropower stations (%).

	Absolutely agree	Agree	Neither agree nor disagree	Disagree	Absolutely disagree
The construction and operation of SHP in the prefecture increases income of the local population (employees in SH stations)	24.7	46.8	19.0	8.8	0.8
The construction and operation of SHP in the prefecture ensures the availability of electricity in perpetuity	26.8	36.6	28.8	6.5	1.3
The construction and operation of SHP in the prefecture has little protective effect on preventing floods	6.2	32.7	46.5	14.3	0.3
The construction and operation of SHP in the prefecture improves the accommodation of residents through the State fees (2%)	6.8	40.0	44.2	8.3	0.8

Table A.3 (*Continued*)

	Absolutely agree	Agree	Neither agree nor disagree	Disagree	Absolutely disagree
The construction and operation of SHP in the prefecture enhances various bodies through its corporate social responsibility and sponsorship	7.0	46.8	33.5	12.5	0.3
The construction and operation of SHP in the prefecture reduces the aesthetics of landscape and environment in general	13.5	32.7	28.1	22.6	3.1
The construction and operation of SHP in the prefecture reduces the fish fauna	11.7	24.9	39.5	23.4	0.5
The construction and operation of SHP in the prefecture disturbs the fauna of the prefecture because of noise from the operation of the plant	19.2	26.2	36.9	16.1	1.6
The construction and operation of SHP in the prefecture upgrades networks (roads. telecommunications)	16.9	58.7	19.7	4.7	0.0
The construction and operation of SHP in the prefecture is a pole of development of ecotourism	8.6	46.5	26.2	16.1	2.6
The construction and operation of SHP in the prefecture reduces emissions of carbon dioxide	14.3	36.6	33.2	12.5	3.4
Legislation in relation to the construction of SHP stations should be more strict	22.1	43.9	23.1	9.1	1.8
The licensing process for the construction of SHP stations should be quick and simple	10.9	35.3	24.9	22.3	6.5
			Yes	No	Don't know
Believe that the council gained the maximum economic benefits of the local community by investors of SHP stations			8.1	24.4	67.5

Table A.4
Priorities in future potential benefits from installation of SHP stations in the prefecture.

		Frequency	Percent
Priority should be given in future potential benefit from SHP stations: Recreation for the local population	Low priority	34	8.8
	Medium priority	199	51.7
	High priority	152	39.5
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Creating employment opportunities	Low priority	2	0.5
	Medium priority	55	14.3
	High priority	328	85.2
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Protection of the nature	Low priority	1	0.3
	Medium priority	29	7.5
	High priority	355	92.2
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Creating an attractive and beautiful landscape	Low priority	12	3.1
	Medium priority	100	26.0
	High priority	273	70.9
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Protect air, water and soil	Low priority	1	0.3
	Medium priority	39	10.1
	High priority	345	89.6
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Production of electrical energy	Low priority	0	0.0
	Medium priority	84	21.8
	High priority	301	78.2
	Total	385	100.0
Priority should be given in future potential benefit from SHP stations: Financial support of the local community	Low priority	3	0.8
	Medium priority	84	21.8
	High priority	298	77.4
	Total	385	100.0

Table A.5
Willingness-to-pay (WTP) for obtaining electricity from SHP stations.

		Frequency	Percent
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation	Absolutely disagree	98	25.5
	Disagree	134	34.8
	Neither agree nor disagree	92	23.9
	Agree	61	15.8
	Absolutely agree	0	0.0
	Total	385	100.0
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy in the future	Absolutely disagree	93	24.2
	Disagree	86	22.3
	Neither agree nor disagree	50	13.0
	Agree	137	35.6
	Absolutely agree	19	4.9
	Total	385	100.0

Table A.6
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

Gender	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Total
Male	36 28.3%	41 32.3%	20 15.7%	30 23.6%	127 100.0%
Female	62 24.0%	93 36.0%	72 27.9%	31 12.0%	258 100.0%
Total	98 25.5%	134 34.8%	92 23.9%	61 15.8%	385 100.0%

Pearson Chi-square: 13.47, df = 3, p-value = 0.004.

Table A.7
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

Age	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Total
$\leq$30	19 28.4%	21 31.3%	9 13.4%	18 26.9%	67 100.0%
31–40	28 18.7%	40 26.7%	46 30.7%	36 24.0%	150 100.0%
41–50	24 20.2%	59 49.6%	36 30.3%	0 0%	119 100.0%
51–60	27 55.1%	14 28.6%	1 2.0%	7 14.3%	49 100.0%
Total	98 25.5%	134 34.8%	92 23.9%	61 15.8%	385 100.0%

Pearson Chi-square: 80.377, df = 9, p-value < 0.001.

Table A.8
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

Education	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Total
Lower	16 88.9%	1 5.6%	1 5.6%	0 0.0%	18 100.0%
Middle	45 28.3%	57 35.8%	28 17.6%	29 18.2%	159 100.0%
Upper	37 17.8%	76 36.5%	63 30.3%	32 15.4%	208 100.0%
Total	98 25.5%	134 34.8%	92 23.9%	61 15.8%	385 100.0%

Pearson Chi-square: 50.592, df = 6, p-value < 0.001.

Table A.9
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

Family income	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Total
<€10,000	22 43.1%	24 47.1%	5 9.8%	0 0.0%	51 100.0%
€10,001–€15,000	40 40.4%	23 23.2%	18 18.2%	18 18.2%	99 100.0%
€15,001–€20,000	15 11.2%	40 29.9%	53 39.6%	26 19.4%	134 100.0%
>€20,000	21 20.8%	47 46.5%	16 15.8%	17 16.8%	101 100.0%
Total	98 25.5%	134 34.8%	92 23.9%	61 15.8%	385 100.0%

Pearson Chi-square: 69.106, df = 9, p-value < 0.001.

Table A.10
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

Occupation	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Total
Farmer	17 73.9%	1 4.3%	0 0.0%	5 21.7%	23 100.0%
Housewife	6 60.0%	0 0.0%	4 40.0%	0 0.0%	10 100.0%
Employee	67 22.6%	105 35.5%	87 29.4%	37 12.5%	296 100.0%
Freelancer	3 12.5%	7 29.2%	1 4.2%	13 54.2%	24 100.0%
Unemployed	5 15.6%	21 65.6%	0 0.0%	6 18.8%	32 100.0%
Total	98 25.5%	134 34.8%	92 23.9%	61 15.8%	385 100.0%

Pearson Chi-square: 96.702, df = 12, p-value < 0.001.

Table A.11
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy in the future.

Gender	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
Male	33 26.0%	16 12.6%	24 18.9%	45 35.4%	9 7.1%	127 100.0%
Female	60 23.3%	70 27.1%	26 10.1%	92 35.7%	10 3.9%	258 100.0%
Total	93 24.2%	86 22.3%	50 13.0%	137 35.6%	19 4.9%	385 100.0%

Pearson Chi-square: 15.187, df = 4, p-value = 0.004.

Table A.12
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy in the future.

Age	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
≤30	17 25.4%	11 16.4%	15 22.4%	24 35.8%	0 0.0%	67 100.0%
31–40	27 18.0%	47 31.3%	7 4.7%	59 39.3%	10 6.7%	150 100.0%
41–50	26 21.8%	23 19.3%	28 23.5%	33 27.7%	9 7.6%	119 100.0%
51–60	23 46.9%	5 10.2%	0 0.0%	21 42.9%	0 0.0%	49 100.0%
Total	93 24.2%	86 22.3%	50 13.0%	137 35.6%	19 4.9%	385 100.0%

Pearson Chi-square: 64.171, df = 12, p-value < 0.001.

Table A.13
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy in the future.

Education	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
Lower	17	0	0	1	0	18
	94.4%	0.0%	0.0%	5.6%	0.0%	100.0%
Middle	46	34	23	45	11	159
	28.9%	21.4%	14.5%	28.3%	6.9%	100.0%
Upper	30	52	27	91	8	208
	14.4%	25.0%	13.0%	43.8%	3.8%	100.0%
Total	93	86	50	137	19	385
	24.2%	22.3%	13.0%	35.6%	4.9%	100.0%

Pearson Chi-square: 67.307, df = 8, p-value < 0.001.

Table A.14
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future.

Family income	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
≤€10,000	24	10	3	14	0	51
	47.1%	19.6%	5.9%	27.5%	0.0%	100.0%
€10,001–15,000	39	3	19	38	0	99
	39.4%	3.0%	19.2%	38.4%	0.0%	100.0%
€15,001–20,000	15	50	9	49	11	134
	11.2%	37.3%	6.7%	36.6%	8.2%	100.0%
>€20,000	15	23	19	36	8	101
	14.9%	22.8%	18.8%	35.6%	7.9%	100.0%
Total	93	86	50	137	19	385
	24.2%	22.3%	13.0%	35.6%	4.9%	100.0%

Pearson Chi-square: 88.637, df = 12, p-value < 0.001.

Table A.15
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future.

Occupation	Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
Farmer	17	0	0	5	1	23
	73.9%	0.0%	0.0%	21.7%	4.3%	100.0%
Housewife	10	0	0	0	0	10
	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Employee	59	73	50	96	18	296
	19.9%	24.7%	16.9%	32.4%	6.1%	100.0%
Freelancer	2	3	0	19	0	24
	8.3%	12.5%	0.0%	79.2%	0.0%	100.0%
Unemployed	5	10	0	17	0	32
	15.6%	31.3%	0.0%	53.1%	0.0%	100.0%
Total	93	86	50	137	19	385
	24.2%	22.3%	13.0%	35.6%	4.9%	100.0%

Pearson Chi-square: 103.585, df = 16, p-value < 0.001.

Table A.16
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future.

		Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation	Absolutely disagree	68	20	5	5	0	98
		69.4%	20.4%	5.1%	5.1%	0.0%	100.0%
	Disagree	20	29	26	50	9	134
		14.9%	21.6%	19.4%	37.3%	6.7%	100.0%
	Neither agree nor disagree	4	37	15	36	0	92
		4.3%	40.2%	16.3%	39.1%	0.0%	100.0%
	Agree	1	0	4	46	10	61
		1.6%	0%	6.6%	75.4%	16.4%	100.0%
	Total	93	86	50	137	19	385
		24.2%	22.3%	13.0%	35.6%	4.9%	100.0%

Pearson Chi-square: 233.804, df = 12, p-value < 0.001.

Table A.17
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation.

		Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
The construction and operation of SHP stations in the prefecture increases income of the local population (employees in SHP stations)	Absolutely disagree	1	1	0	1	0	3
		33.3%	33.3%	0.0%	33.3%	0.0	100.0%
	Disagree	2	15	10	7	0	34
		5.9%	44.1%	29.4%	20.6%	0.0	100.0%
	Neither agree nor disagree	35	20	10	8	0	73
		47.9%	27.4%	13.7%	11.0%	0.0	100.0%
	Agree	57	59	33	31	0	180
		31.7%	32.8%	18.3%	17.2%	0.0	100.0%
	Absolutely agree	3	39	39	14	0	95
		3.2%	41.1%	41.1%	14.7%	0.0	100.0%
	Total	98	134	92	61	0	385
		25.5%	34.8%	23.9%	15.8%	0.0	100.0%

Pearson Chi-square: 65.067, df = 12, p-value < 0.001.

Table A.18
Willing to pay higher municipal taxes for the construction and operation of municipal SHP stations, with the benefit of lower electrical energy prices in the future.

		Absolutely disagree	Disagree	Neither agree nor disagree	Agree	Absolutely agree	Total
The construction and operation of SHP stations in the prefecture increases income of the local population (employees in SHP stations)	Absolutely disagree	2	0	0	0	1	3
		66.7%	0.0%	0%	0.0%	33.3%	100.0%
	Disagree	5	1	15	12	1	34
		14.7%	2.9%	44.1%	35.3%	2.9%	100.0%
	Neither agree nor disagree	25	20	16	12	0	73
		34.2%	27.4%	21.9%	16.4%	0.0%	100.0%
	Agree	58	46	0	59	17	180
		32.2%	25.6%	0.0%	32.8%	9.4%	100.0%
	Absolutely agree	3	19	19	54	0	95
		3.2%	20.0%	20.0%	56.8%	0.0%	100.0%
	Total	93	86	50	137	19	385
		24.2%	22.3%	13.0%	35.6%	4.9%	100.0%

Pearson Chi-square: 136.221, df = 16, p-value < 0.001.

Appendix B. Variables' operationalization

Individual-level demographic variables	Values
Age	Age cohorts: ≤30 years old (1), 31–40 (2), 41–50 (3), 51–60 (4)
Gender	Male (1), female (2)
Level of Education	Lower (1), middle (2), upper (3)
Income	1: ≤€10,000, 2: €10,001–€15,000, 3: €15,001–€20,000, 4: >€20,000
Occupation	1: Farmer 2: Housewife 3: Employee 4: Freelancer 5: Unemployed

Environmental information variables, including RES and SHP stations	Values
Quality of life is very good	1: Absolutely disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Absolutely agree
There are no employment opportunities	- || -
Great industrial development	–
The development of the prefecture relies on renewable energy	–
The future development of the prefecture should be based on renewable energy	–
The construction and operation of SHP stations in the prefecture increases income of the local population (employees in SHP stations)	–

(*Continued*)

Environmental information variables, including RES and SHP stations	Values
The construction and operation of SHP stations in the prefecture ensures the availability of electricity in perpetuity	–
The construction and operation of SHP stations in the prefecture has little protective effect on preventing floods	–
The construction and operation of SHP stations in the prefecture improves the accommodation of residents through the State fees (2%)	–
The construction and operation of SHP stations in the prefecture enhances various bodies through its corporate social responsibility and sponsorship	–
The construction and operation of SHP stations in the prefecture reduces the aesthetics of landscape and environment in general	–
The construction and operation of SHP in the prefecture reduces the fish fauna	–
The construction and operation of SHP stations in the prefecture disturbs the fauna of the prefecture because of noise from the operation of the plant	–
The construction and operation of SHP stations in the prefecture upgrades networks (roads, telecommunications)	–
The construction and operation of SHP stations in the prefecture is a pole of development of ecotourism	–
The construction and operation of SHP stations in the prefecture reduces emissions of carbon dioxide	–
Believe that the council gained the maximum economic benefits of the local community by investors of SHP stations	–
Legislation in relation to the construction of SHP stations should be more strict	–
The licensing process for the construction of SHP stations should be quick and simple	–
Priority should be given in future potential benefit from SHP stations: recreation for the local population	1: Low priority 2: Medium priority 3: High priority
Priority should be given in future potential benefit from SHP stations: creating employment opportunities	–
Priority should be given in future potential benefit from SHP stations: protection of the nature	–
Priority should be given in future potential benefit from SHP stations: creating an attractive and beautiful landscape	–
Priority should be given in future potential benefit from SHP stations: protect air, water and soil	–
Priority should be given in future potential benefit from SHP stations: production of electrical energy	–
Priority should be given in future potential benefit from SHP stations: financial support of the local community	–

Dependent variables	Values
Willing to pay higher PPC prices for increased SHP stations contribution in electricity generation	1: Absolutely disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Absolutely agree
Willing to pay higher municipal taxes for the construction of municipal SHP stations, with the benefit of lower electrical energy prices in the future	1: Absolutely disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Absolutely agree

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